

Listing of Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently Amended) An image processing apparatus comprising:
input device which inputs an image sensed by image sensing device;
acquisition device which acquires at least one ~~color-signal~~ pixel value pair ~~indicating~~
~~color-signal values from an image~~ based on a source pixel value obtained from an image and a
destination pixel value obtained from an image;
determination device which determines an image processing parameter for converting
one pixel value of the pixel value pair into the other pixel value of said pixel value pair, on the
basis of the acquired ~~color-signal~~ pixel value pair;
registration device which registers the image processing parameter determined by said
determination device; and
conversion device which converts ~~color-signal~~ pixel values of an input image input by
said input device on the basis of the image processing parameter ~~determined by said~~
~~determination device~~ registered by said registration device, and outputs a converted image as an
output image.
2. (Currently Amended) The apparatus according to claim 1, wherein said acquisition
device acquires the ~~color-signal~~ pixel value pair on the basis of a pair of pixel ~~color-signal~~ values
of corresponding pixels in a first image[5] and a second image obtained by retouching the first
image.

3. (Currently Amended) The apparatus according to claim 1, wherein said acquisition device acquires the ~~color-signal~~ pixel value pair based on a pair of pixel values from one image recorded on a detachable recording medium.

4. (Currently Amended) The apparatus according to claim 1, wherein said acquisition device acquires the ~~color-signal~~ pixel value pair ~~from color-signal~~ based on a pair of pixel values of corresponding pixels in a first image recorded on a detachable recording medium, and a second image which is recorded on the detachable recording medium and is different from the first image.

5. (Currently Amended) The apparatus according to claim 1, further comprising designation device which allows a user to designate a ~~region~~ pair of regions on ~~the~~ an image, and wherein said acquisition device acquires at least one ~~color-signal~~ pixel value pair corresponding to the ~~region~~ pair of regions designated by said designation device.

6. (Currently Amended) The apparatus according to claim 2, wherein for each of a plurality of grid points set on a color space,

said acquisition device extracts pixels having ~~color-signal~~ pixel values near a grid point of interest from the first image, and extracts pixels in the second image corresponding to the extracted pixels,

said acquisition device determines a ~~color-signal~~ pixel value after change of the grid point of interest on the basis of the ~~signal~~ pixel values of the pixels extracted from the first and second images, and

said acquisition device sets a ~~color-signal pixel~~ pixel value of the grid point of interest, and the determined ~~color-signal pixel~~ pixel value after change as the ~~color-signal pixel~~ pixel value pair.

7. (Original) The apparatus according to claim 2, wherein the first and second images have the same image size, and are stored in a storage medium in the same image format.

8. (Currently Amended) The apparatus according to claim 2, wherein ~~said conversion device processes a sensed image obtained from image sensing device as the input image, and~~
the first and second images are thumbnail images obtained by reducing ~~the sensed image~~
images input by said input device.

9. (Currently Amended) The apparatus according to claim 1, wherein said acquisition device includes an acquiring unit which acquires a designated value pair consisting of first and second ~~color-signal pixel~~ pixel values on the basis of first and second designated positions designated on one or two images, and a determination unit which determines the ~~color-signal pixel~~ pixel value pair on the basis of the designated value pair.

10. (Currently Amended) The apparatus according to claim ~~8~~ 9, wherein for each of a plurality of grid points set on a color space,

said acquisition device extracts designated value pairs, the first color signal values of which are located near a grid point of interest, from designated value pairs acquired by said acquiring unit,

said acquisition device determines a color signal value after change of the grid point of interest on the basis of changes of the first and second ~~color-signal pixel~~ values in the extracted designated value pairs, and

said acquisition device sets the ~~color-signal pixel~~ value of the grid point of interest, and the determined ~~color-signal pixel~~ value after change as the ~~color-signal pixel~~ value pair.

11. (Currently Amended) The apparatus according to claim 9, wherein the ~~first and second~~ two images have the same image size, and are stored in a storage medium in the same image format.

12. (Currently Amended) The apparatus according to claim 9, wherein ~~said conversion device processes a sensed image obtained from image sensing device as the input image, and~~ the ~~first and second~~ two images are thumbnail images having a smaller size than the ~~sensed input image to be converted by said conversion device.~~

13. (Original) The apparatus according to claim 1, further comprising:

selection device which selects one of a plurality of processing modes using different image processing parameters, and

wherein said registration device registers the image processing parameter determined by said determination device as one of the plurality of processing modes, and

when said selection device selects one of the processing modes, said conversion device executes a conversion process using the image processing parameter registered by said registration device.

14. (Currently Amended) The apparatus according to claim 1, ~~wherein~~ further comprising holding device which stores the image processing parameter determined by said determination device in a first storage ~~device~~ medium, and

wherein said conversion device stores the output image in a second storage medium.

15. (Original) The apparatus according to claim 1, further comprising:

display device which displays the image, and

wherein said registration device registers a plurality of different image processing parameters in correspondence with a processing mode, and

the plurality of different image processing parameters are displayed on said display device.

16. (Currently Amended) The apparatus according to claim 1, wherein the conversion process includes:

inputting ~~a sensed image obtained by an image sensing unit~~ as an input image input by said input device,

processing the ~~sensed~~ input image by interpolation so that all pixels of respective color components have values;

amplifying a color difference of the input image that has undergone the interpolation process;

applying gamma conversion to the input image whose color difference has been amplified; and

applying hue correction to the input image that has undergone the gamma conversion,
and

said determination device changes parameters in the interpolation process, color
difference amplification, and hue correction.

17. (Currently Amended) The apparatus according to claim 1, wherein said determination
device applies inverse conversion of said conversion device to the ~~color-signal~~ pixel value before
conversion of the ~~color-signal~~ pixel value pair using an image processing parameter which is set
in advance, and

said determination device changes the image processing parameter to reduce a difference
between a ~~color-signal~~ pixel value obtained by processing the ~~color-signal~~ pixel value obtained
by the inverse conversion by said conversion device, and the ~~color-signal~~ pixel value after
conversion of the ~~color-signal~~ pixel value pair.

18. (Currently Amended) The apparatus according to claim 1, wherein the conversion
process has:

multi-dimensional lookup table conversion device which converts an image using a
multi-dimensional lookup table to obtain an output image, and

said determination device changes the multi-dimensional lookup table on the basis of the
~~color-signal~~ pixel value pair.

19. (Original) The apparatus according to claim 18, wherein the multi-dimensional lookup
table is a three-dimensional lookup table including R, G, and B as elements.

20. (Canceled)

21. (Currently Amended) An image processing method comprising:

inputting an image sensed by image sensing device;

acquiring at least one color-signal pixel value pair indicating color signal values from an image based on a source pixel value obtained from an image and a destination pixel value obtained from an image;

determining an image processing parameter for converting one pixel value of the pixel value pair into the other pixel value of said pixel value pair, on the basis of the acquired color-signal pixel value pair;

registering the determined image processing parameter determined in the determination step; and

converting color-signal pixel values of an input image input by said input device on the basis of the registered image processing parameter determined in the determination step, and outputting a converted image as an output image.

22. (Original) An apparatus for generating a color conversion table, comprising:

storage device which stores first and second images, pixel values of which are expressed on an N-dimensional color space;

generation device which generates an N-dimensional color conversion table on the basis of differences between pixel values of corresponding pixels in the first and second images; and

adjustment device which adjusts generation of table values of the color conversion table

by said generation device so that a change amount of a pixel value defined by the color conversion table generated by said generation device does not exceed a predetermined value.

23. (Original) The apparatus according to claim 22, wherein said generation device comprises:

detection device which detects, from the first image, pixels having pixel values within a predetermined distance range from a grid point value of a grid point selected from respective grid points of the N-dimensional color conversion table;

calculation device which calculates an average value of differences between pixel values of corresponding pixels in the first and second images in association with the pixels detected by said detection device; and

determination device which determines a value of the selected grid point on the basis of the average value calculated by said calculation device.

24. (Original) The apparatus according to claim 22, wherein when a distance between the pixel values of the corresponding pixels on the color space exceeds a threshold value, said adjustment device adjusts the difference between the pixel values of the corresponding pixels on the basis of the distance and the threshold value.

25. (Original) The apparatus according to claim 24, wherein let $(A_0, A_1, A_2, \dots, A_N)$ be pixel values in the first image, $(B_0, B_1, B_2, \dots, B_N)$ be pixel values of corresponding pixels in the second image, and Diff be the distance, and when the distance Diff given by:

$$Diff = \sqrt{(A_0 - B_0)^2 + (A_1 - B_1)^2 + (A_2 - B_2)^2 + \dots + (A_N - B_N)^2}$$

is larger than a predetermined threshold value T, said adjustment device multiplies differences between the corresponding pixels for respective components by a value obtained based on the threshold value T and the distance Diff.

26. (Original) The apparatus according to claim 24, wherein said adjustment device determines, as the distance, a maximum value Diff of differences between pixel values for respective components of corresponding pixels of the first and second images, and when the distance is larger than a predetermined threshold value T, said adjustment device multiplies the differences for respective components by a value obtained based on the threshold value T and the distance Diff.

27. (Original) The apparatus according to claim 22, wherein when a distance between pixel values before and after conversion by the color conversion table generated by said generation device exceeds a threshold value, said adjustment device adjusts a corresponding table value in the color conversion table.

28. (Original) The apparatus according to claim 27, wherein let $(A_0, A_1, A_2, \dots, A_N)$ be pixel values before conversion by the color conversion table, $(B_0, B_1, B_2, \dots, B_N)$ be pixel values after conversion, and Diff be the distance, and when the distance Diff given by:

$$Diff = \sqrt{(A_0 - B_0)^2 + (A_1 - B_1)^2 + (A_2 - B_2)^2 + \dots + (A_N - B_N)^2}$$

is larger than a predetermined threshold value T, said adjustment device updates the color conversion table by multiplying the corresponding table value by a value obtained based on the threshold value T and the distance Diff.

29. (Original) The apparatus according to claim 27, wherein said adjustment device determines, as the distance, a maximum value Diff of differences between pixel values before and after conversion by the color conversion table for respective components, and when the distance is larger than a predetermined threshold value T, said adjustment device updates the color conversion table by multiplying the corresponding table value by a value obtained based on the threshold value T and Diff.

30. (Original) The apparatus according to claim 22, wherein when a difference between grid point data of the color conversion table generated by said generation device and a reference table is not less than a predetermined value, said adjustment device adjusts the grid point data of the color conversion table.

31. (Original) The apparatus according to claim 30, wherein let $(A_0, A_1, A_2, \dots, A_N)$ be grid point data of the color conversion table, $(B_0, B_1, B_2, \dots, B_N)$ be grid point data of the reference table, and Diff be the difference, and when the difference Diff given by:

$$Diff = \sqrt{(A0-B0)^2 + (A1-B1)^2 + (A2-B2)^2 + \dots + (An-Bn)^2}$$

is larger than a predetermined threshold value T, said adjustment device multiplies the grid point data by a value obtained based on the threshold value T and the difference Diff.

32. (Original) The apparatus according to claim 31, wherein when a maximum value Diff of differences between corresponding grid point data of the color conversion table and reference table for respective components is larger than the threshold value T, said adjustment device multiplies respective components of the grid point data of the color conversion table by a value obtained based on the threshold value T and Diff.

33. (Original) The apparatus according to claim 22, further comprising:
conversion device which convertes data of respective grid points of the color conversion table generated by said generation device into data on an M-dimensional space.

34. (Original) A method for generating a color conversion table, comprising:
generating an N-dimensional color conversion table on the basis of differences between pixel values of corresponding pixels in first and second images, pixel values of which are expressed on an N-dimensional color space; and
adjusting generation of table values of the color conversion table in the generating step so that a change amount of a pixel value defined by the color conversion table generated in the generation step does not exceed a predetermined value.

35. (Original) A color conversion apparatus comprising:
- input device which inputs image data;
 - conversion device which converts the image data input by said input device using a color conversion table generated by a conversion table generation apparatus of claim 22; and output device which outputs image data converted by said conversion device.
36. (Original) The apparatus according to claim 35, wherein for each pixel value of the image data,
- said conversion device extracts a grid point near the pixel value from the conversion table,
 - said conversion device calculates a distance between the pixel value and the extracted grid point, and
 - said conversion device obtains a pixel value after conversion of the pixel value on the basis of grid point values of the extracted grid point and grid points near the extracted grid point, and the calculated distance.
37. (Original) A color conversion method comprising:
- inputting image data;
 - converting the image data input in the input step using a color conversion table generated by a conversion table generation method of claim 34; and
 - outputting image data converted in the converting step.

38. (Original) A control program for making a computer execute an image processing method of claim 21.
39. (Original) A computer readable memory storing a control program for making a computer execute an image processing method of claim 21.
40. (Original) A control program for making a computer execute a table generation method of claim 34.
41. (Original) A computer readable memory storing a control program for making a computer execute a table generation method of claim 34.
42. (Original) An image sensing apparatus for implementing a color conversion table generation method of claim 34.
43. (Original) An image sensing apparatus comprising a color conversion apparatus of claim 35.